



AI4EIC - Introduction

Organizers:

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Center for Frontiers in Nuclear Science



Stony Brook University



Welcome

- Welcome Everyone to AI4EIC!
- Yesterday was a US national holiday, hopefully you spent a great long weekend and are ready and excited as we are to start this workshop.
- We wished this workshop had been held in person... unfortunately the current situation with COVID does not allow it. Hopefully next year we will be able to meet in-person...



Introduction / Scope

- Artificial intelligence is transforming our world and is growing in importance in nuclear and particle physics.
- AI4EIC is the first workshop of Artificial Intelligence dedicated to the future Electron Ion Collider.
- The focus of this workshop in particular is on Experimental Applications, therefore the suffix “exp” in AI4EIC-exp
- The choice of the naming will allow in the future to organize other workshops which can be either broad in scope, *i.e.*, AI4EIC, or relative to a specific domain of applications, *e.g.*, for theory or phenomenology AI4EIC-th/ph.



1950s

ARTIFICIAL INTELLIGENCE

A program that can sense, reason, act, and adapt

Bayesian methods
Genetic Algorithms,
Rules-based system,
...

AI

MACHINE LEARNING

Algorithms that learn patterns in data over time

Random Forest,
Support Vector Machines,
XGBoost,
...

ML

DEEP LEARNING

Multilayered neural networks learn from vast amount of data

CNN, RNN, GAN, ...

DL

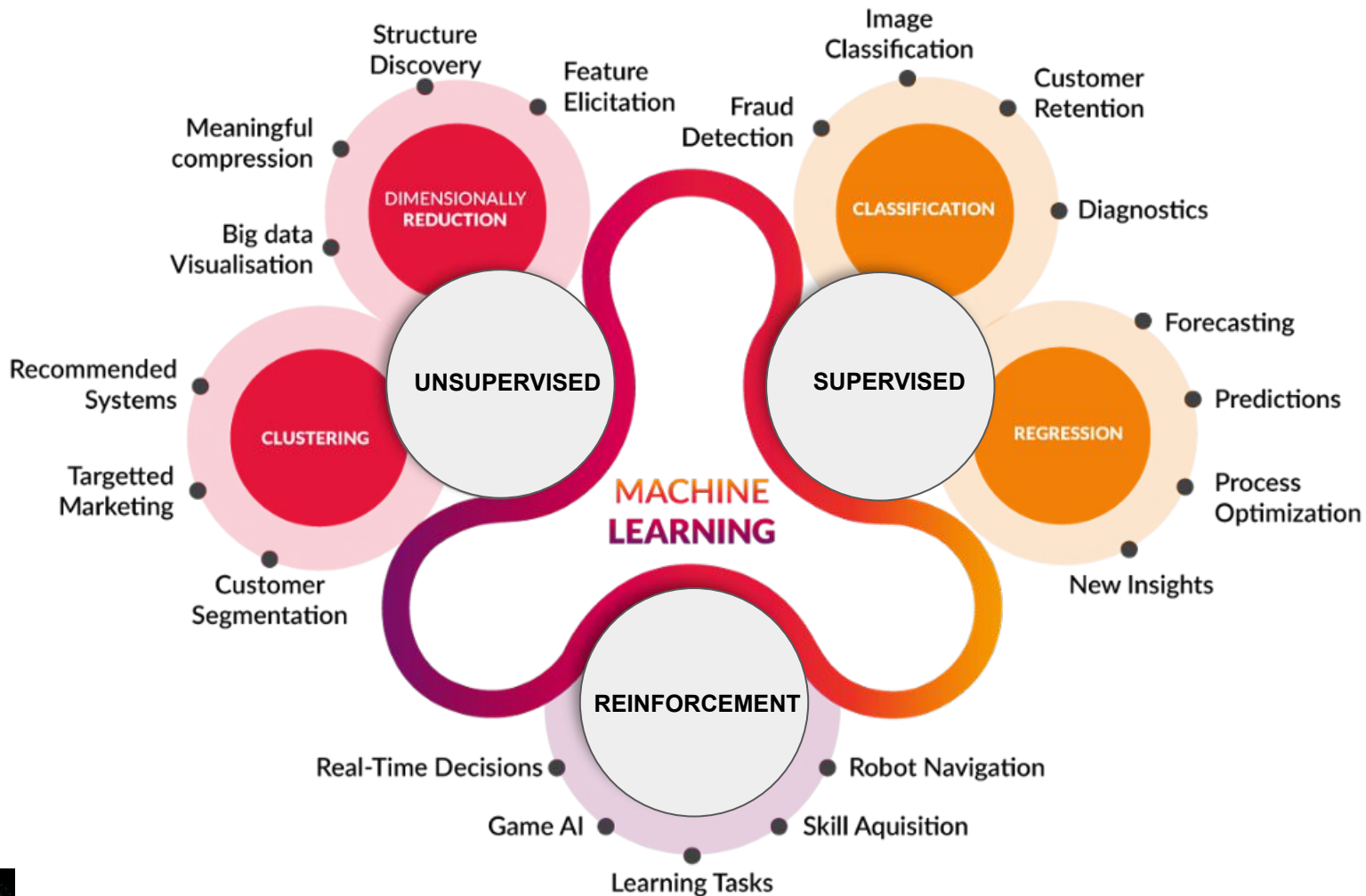
Data Science blends data analytics, computer science and business domain expertise to solve problems.

DS

Data Analytics is the practice of using Machine Learning algorithms and visualization to derive insights.

2010s -





Scope

- AI will be an essential part of future experiments like the Electron Ion Collider, a cutting-edge QCD facility. See next talk by Rolf Ent on the EIC Overview and Schedule.
 - The EIC program will be one of the first to systematically leveraging AI in the design and R&D phases.
 - AI will be at the heart of many aspects of EIC, for the accelerator and detector control, data monitoring, processing, reconstruction and analysis...
- The goal of the AI4EIC-exp workshop is to address in this strategic moment how AI might contribute to advance research, design and operation of the future EIC.
- AI is overarching and influences the development of software and computing choices.
- The Workshop is bringing together all relevant communities to provide an inclusive venue for discussion.



Structure and Timetable

- Tuesday, September 7
 - Morning
 - 9:20 EIC Overview and Schedule, Rolf Ent
 - 10:00-13:00 Session: **Accelerator and Detector Design**
 - Afternoon
 - 14:00-17:00 Session: **Simulations**
- Wednesday, September 8
 - Morning
 - 10:00-13:00 Session: **Reconstruction & Analysis**
 - Afternoon
 - 14:00-17:00 Session: **Reconstruction & Analysis**
- Thursday, September 9
 - Morning
 - 10:00-13:00 Session: **Accelerator & Detector Control**
 - Afternoon
 - 14:00-17:00 Session: **Detector Readout**
- Friday, September 10
 - Morning
 - 10:00-11:35 Session: **Computing Frontiers**
 - 11:50-13:00 Panel Discussion: Computing Frontiers
 - Afternoon
 - 14:00-15:15 AI4EIC: Future Workshops, Outreach
 - 15:30-16:30 Summaries from Conveners
 - 16:30 Adjourn

6 sessions with plenary talks

(eastern standard time)

Conveners:

- Design: Friederike Bock (ORNL) , Malachi Schram (JLab)
- Simulations: Corey Adams (ANL) , Makoto Asai (SLAC)
- R&A: Liliana Teodorescu (Brunel U.) , Thomas Ullrich (BNL) , Yulia Furletova (Jefferson Lab)
- Control: Benjamin Nachman (LBNL), Thomas Britton (JLab)
- Readout: Jin Huang (Brookhaven National Lab) , Philip Harris (MIT)
- Computing: Gabriel Perdue (Fermilab) , Olivier Pfister (U. Va.) , Wouter Deconinck (UManitoba)

Thanks to all the conveners for their great work!



Additional Information

- Session characteristics
 - two blocks with a break of 15 mins in between.
 - 2nd block includes ~30 minutes for final discussion.
 - 1 hour break (lunch, ET) between morning and afternoon sessions.
- Live document for Q&A [[link to google docs here](#)]
 - Everyone has access and can add/edit questions
 - Conveners will use the live document to guide the discussion.
 - After each talk there will be few minutes for questions.
 - Pending questions will be addressed in the final discussion time.
- Code of conduct is provided on the indico webpage. Please contact the organizers for any related matter.
- AI4EIC has its website: <https://eic.ai>



ENJOY the WORKSHOP

Amber Boehnlein, Cristiano Fanelli, Jan Bernauer, Tanja Horn

